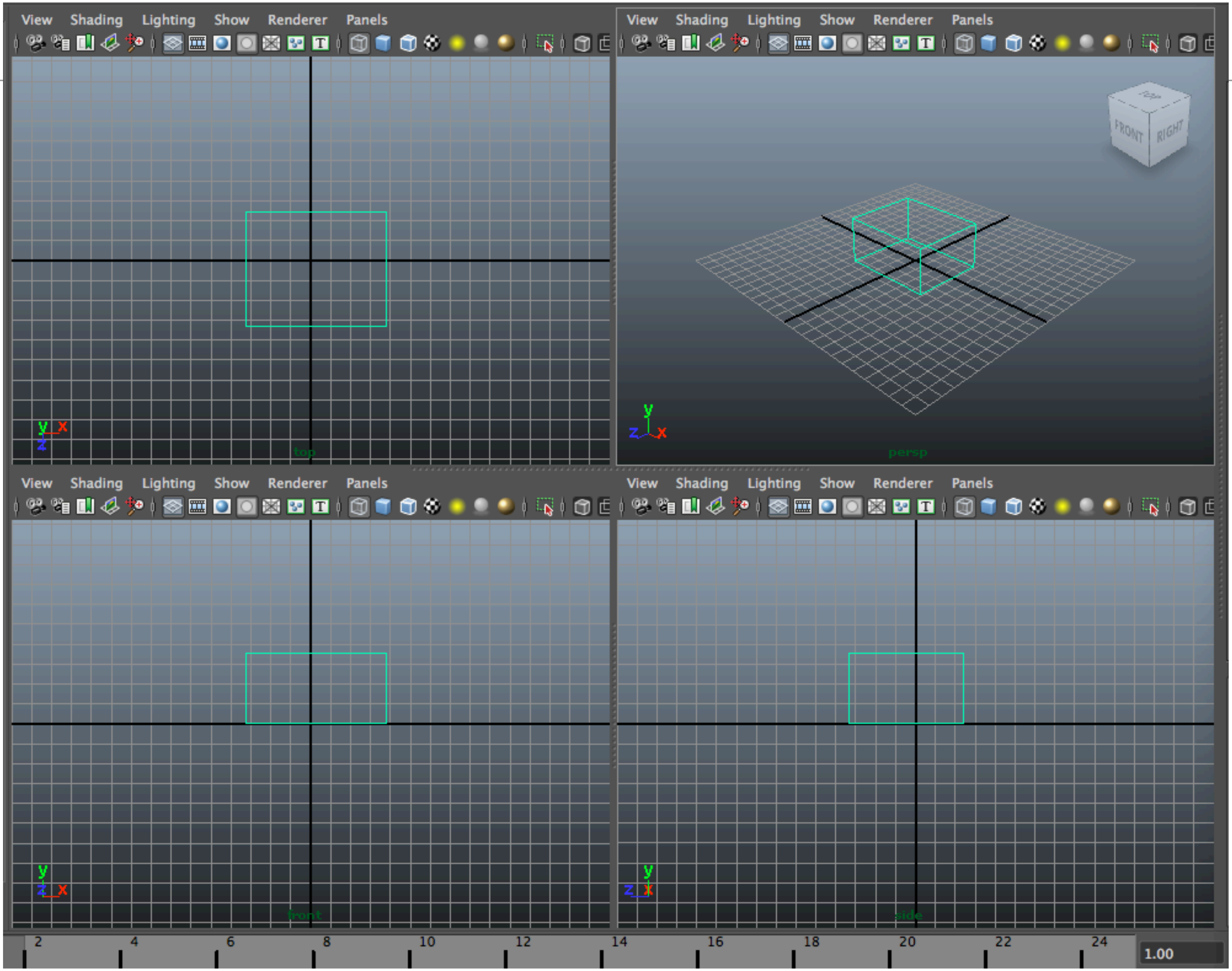
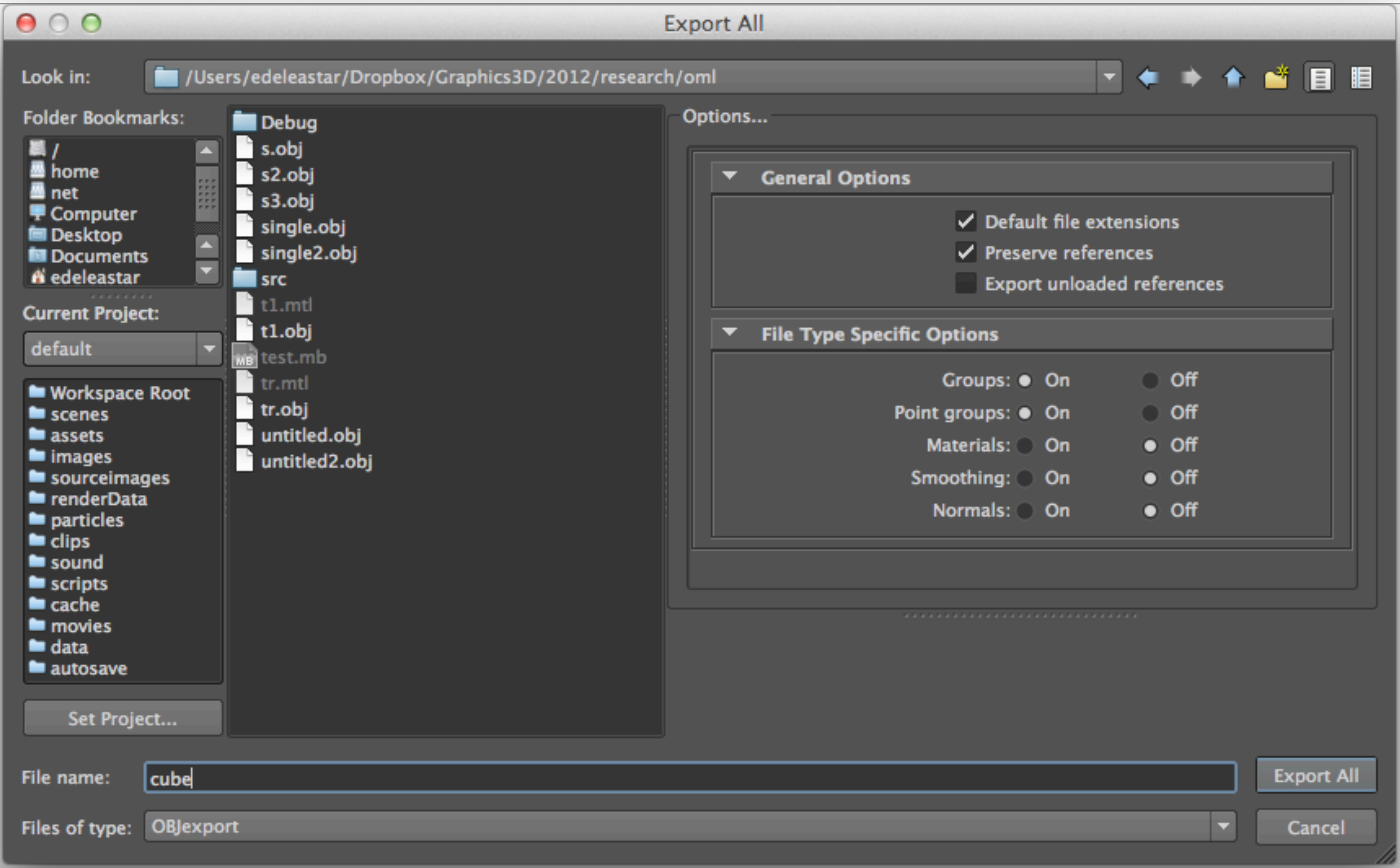
Wavefront 1: Model & Code (lab06a)

OpenGL

Maya 2012 - Draw a Cube



Export as Wavefront file



Look in: /Users/edeleastar/Dropbox/Graphics3D/2012/research/oml

General Options

- ✓ Default file extensions
- ✓ Preserve references
- ☐ Export unloaded references

File Type Specific Options

Groups:	[✓ On]	Off
Point groups:	[✓ On]	Off
Materials:	On	[✓ Off]
Smoothing:	On	[✓ Off]
Normals:	On	[✓ Off]

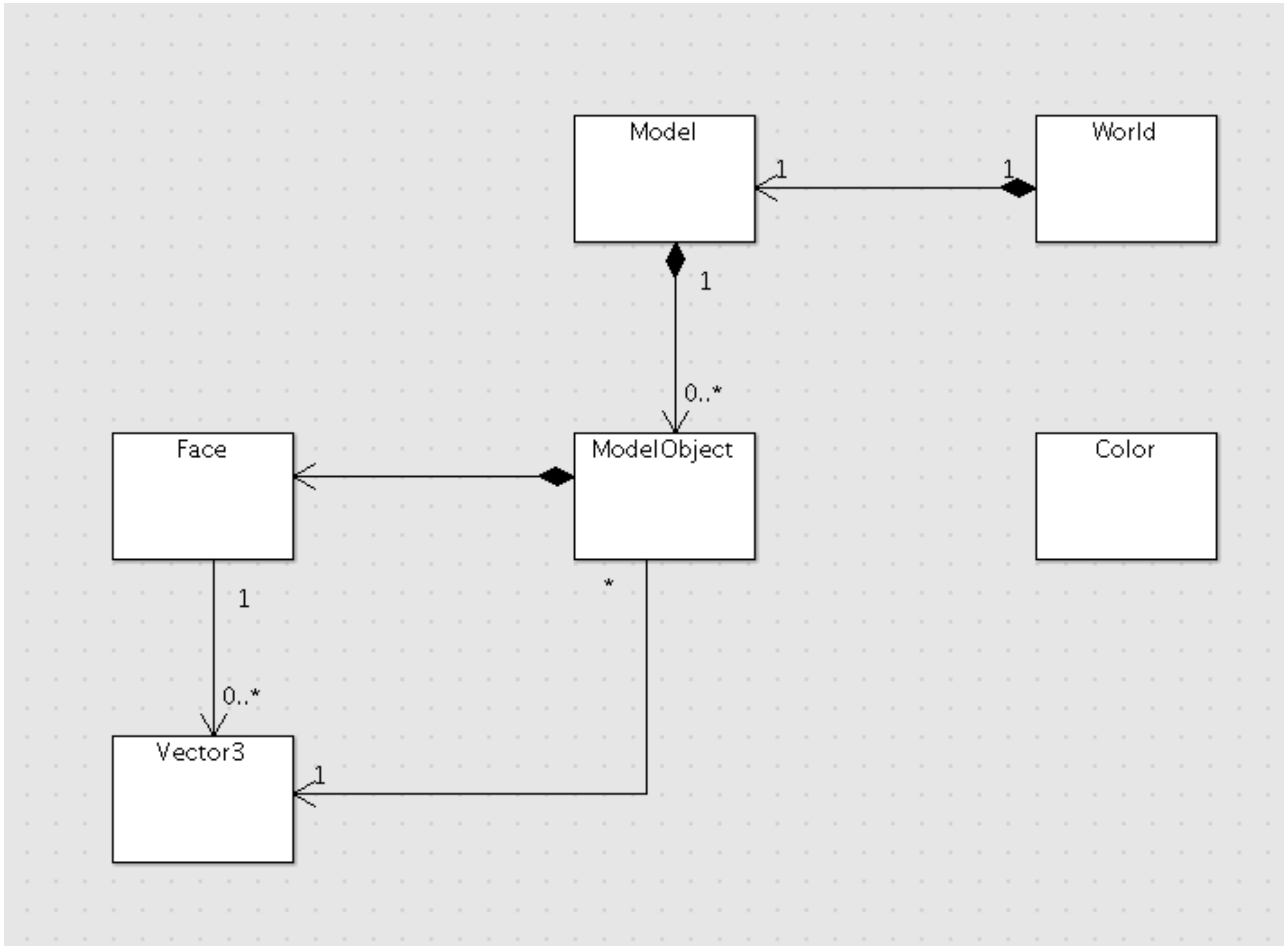
File name: cube

Files of type: OBJexport

cube.obj

```
# This file uses centimeters as units for non-parametric coordinates.

g default
v -3.271605 0.000000 3.333333
v 3.827160 0.000000 3.333333
v -3.271605 3.566200 3.333333
v 3.827160 3.566200 3.333333
v -3.271605 3.566200 -2.407407
v 3.827160 3.566200 -2.407407
v -3.271605 0.000000 -2.407407
v 3.827160 0.000000 -2.407407
vt 0.375000 0.000000
vt 0.625000 0.000000
vt 0.375000 0.250000
vt 0.625000 0.250000
vt 0.375000 0.500000
vt 0.625000 0.500000
vt 0.375000 0.750000
vt 0.625000 0.750000
vt 0.375000 1.000000
vt 0.625000 1.000000
vt 0.875000 0.000000
vt 0.875000 0.250000
vt 0.125000 0.000000
vt 0.125000 0.250000
g pCube1
f 1/1 2/2 4/4 3/3
f 3/3 4/4 6/6 5/5
f 5/5 6/6 8/8 7/7
f 7/7 8/8 2/10 1/9
f 2/2 8/11 6/12 4/4
f 7/13 1/1 3/3 5/14
```

Model



Color & Vector3

```
struct Color
{
  float R;
  float G;
  float B;
  float A;

  static Color White;
  static Color Yellow;
  static Color Red;
  static Color Magenta;
  static Color Cyan;
  static Color Green;
  static Color Black;
  static Color Blue;


  Color();
  Color(float r, float g, float b, float a=1.0f);
  Color(int r, int g, int b, int a=255);

  void render();
  void renderClear();
};
```

```
struct Vector3
{
  float X;
  float Y;
  float Z;

  static Vector3 UnitX;
  static Vector3 UnitY;
  static Vector3 UnitZ;

  Vector3(float x, float y, float z);
  Vector3(float value);
  Vector3();
  Vector3(std::istream& is);

  void translate();
  void rotate (float angle);

  void render();
};
```

Face

```
struct Face
{
  int vertices[3];
  int textures[3];

  Face(std::istream& is);
  void render(std::vector <Vector3>&);
};
```

```
g default
v -3.271605 0.000000 3.333333
v 3.827160 0.000000 3.333333
v -3.271605 3.566200 3.333333
v 3.827160 3.566200 3.333333
v -3.271605 3.566200 -2.407407
v 3.827160 3.566200 -2.407407
v -3.271605 0.000000 -2.407407
v 3.827160 0.000000 -2.407407
g pCube1
f 1/1 2/2 4/4 3/3
f 3/3 4/4 6/6 5/5
f 5/5 6/6 8/8 7/7
f 7/7 8/8 2/10 1/9
f 2/2 8/11 6/12 4/4
f 7/13 1/1 3/3 5/14
```

```
using namespace std;

Face::Face(istream& is)
{
  char ch1;
  for (int i = 0; i < 4; i++)
  {
    string separator;
    is >> vertices[i];
    is >> ch1;
    is >> textures[i];
  }
}

void Face::render(std::vector <Vector3>&defaultTable)
{
  glBegin(GL_QUADS);
  for (int i=0; i<4; i++)
  {
    glVertex3f( defaultTable[vertices[i] - 1].X,
                defaultTable[vertices[i] - 1].Y,
                defaultTable[vertices[i] - 1].Z );
  }
  glEnd();
}
```

ModelObject

```
struct ModelObject
{
  std::string name;
  std::vector<Face> faces;
  std::vector <Vector3> vertices;

  ModelObject();
  ModelObject(std::istream&);
  void render(std::vector <Vector3>&);
};
```

```
g default
v -3.271605 0.000000 3.333333
v 3.827160 0.000000 3.333333
v -3.271605 3.566200 3.333333
v 3.827160 3.566200 3.333333
v -3.271605 3.566200 -2.407407
v 3.827160 3.566200 -2.407407
v -3.271605 0.000000 -2.407407
v 3.827160 0.000000 -2.407407
g pCube1
f 1/1 2/2 4/4 3/3
f 3/3 4/4 6/6 5/5
f 5/5 6/6 8/8 7/7
f 7/7 8/8 2/10 1/9
f 2/2 8/11 6/12 4/4
f 7/13 1/1 3/3 5/14
```

```
ModelObject::ModelObject()
{}
ModelObject::ModelObject(istream& is)
{
  string indicator;
  is >> name;
  bool stillGroup=true;
  do
  {
    is >> indicator;
    if (indicator == "v")
    {
      vertices.push_back(Vector3(is));
    }
    else if (indicator == "f")
    {
      faces.push_back(Face(is));
    }
    else if (indicator == "g")
    {
      stillGroup = false;
    }
    else
    {
      string buf;
      getline(is, buf);
    }
  } while (stillGroup && !is.eof());
  is.putback(indicator[0]);
}
```

```
void ModelObject::render(vector <Vector3>&defaultTable)
{
 for (unsigned int i = 0; i < faces.size(); i++)
  {
    faces[i].render(defaultTable);
  }
}
```

Model

```
typedef std::map <std::string, ModelObject>  ModelMap;
typedef ModelMap::iterator ModelMapIterator;

struct Model
{
  ModelMap  modelObjects;

  Model();
  bool load(std::istream &is);
  void render();
};
```

```
g default
v -3.271605 0.000000 3.333333
v 3.827160 0.000000 3.333333
v -3.271605 3.566200 3.333333
v 3.827160 3.566200 3.333333
v -3.271605 3.566200 -2.407407
v 3.827160 3.566200 -2.407407
v -3.271605 0.000000 -2.407407
v 3.827160 0.000000 -2.407407
g pCube1
f 1/1 2/2 4/4 3/3
f 3/3 4/4 6/6 5/5
f 5/5 6/6 8/8 7/7
f 7/7 8/8 2/10 1/9
f 2/2 8/11 6/12 4/4
f 7/13 1/1 3/3 5/14
```

```
Model::Model()
{
}

bool Model::load(istream& is)
{
  string indicator;
  is >> indicator;
  while (!is.eof())
  {
    if (indicator == "#")
    {
      string buf;
      getline(is, buf);
    }
    else if (indicator == "g")
    {
      ModelObject a(is);
      if (modelObjects.find(a.name) == modelObjects.end())
      {
        modelObjects[a.name] = a;
      }
    }
    is >> indicator;
  }

  return true;
}
```

```
void Model::render()
{
  ModelMapIterator defaultIter = modelObjects.find("default");
  if (defaultIter != modelObjects.end())
  {
    ModelObject defaultObject(defaultIter->second);
    for (ModelMapIterator iter = modelObjects.begin(); iter != modelObjects.end(); iter++)
    {
      iter->second.render(defaultObject.vertices);
    }
  }
}
```

World Definition

```
#define theWorld World::GetInstance()

class World
{
  public:
    static World& GetInstance();

    void setCmdlineParams(int*argc, char **argv);
    void initialize(int width, int height, std::string name);
    void start();
    void loadModel (std::string modelName);

    void render();
    void keyPress(unsigned char ch);

  private:
    static World* s_World;
    Model theModel;
    int   *argc;
    char **argv;
};
```

World Support Functions

```
void reshape(int w, int h)
{
  glViewport(0, 0, (GLsizei) w, (GLsizei) h);
  glMatrixMode ( GL_PROJECTION);

  glLoadIdentity();
  gluPerspective(60, (GLfloat) w / (GLfloat) h, 1.0, 1000.0);
  glMatrixMode ( GL_MODELVIEW);
}

void renderScene(void)
{
  theWorld.render();
}

void keyboard(unsigned char key, int x, int y)
{
  theWorld.keyPress(key);
}

World& World::GetInstance()
{
  if (s_World == NULL)
  {
    s_World = new World();
  }
  return *s_World;
}

void World::setCmdlineParams(int*argc, char **argv)
{
  this->argc = argc;
  this->argv = argv;
}
void World::keyPress(unsigned char ch)
{
  glutPostRedisplay();
}
```

World Initialisation

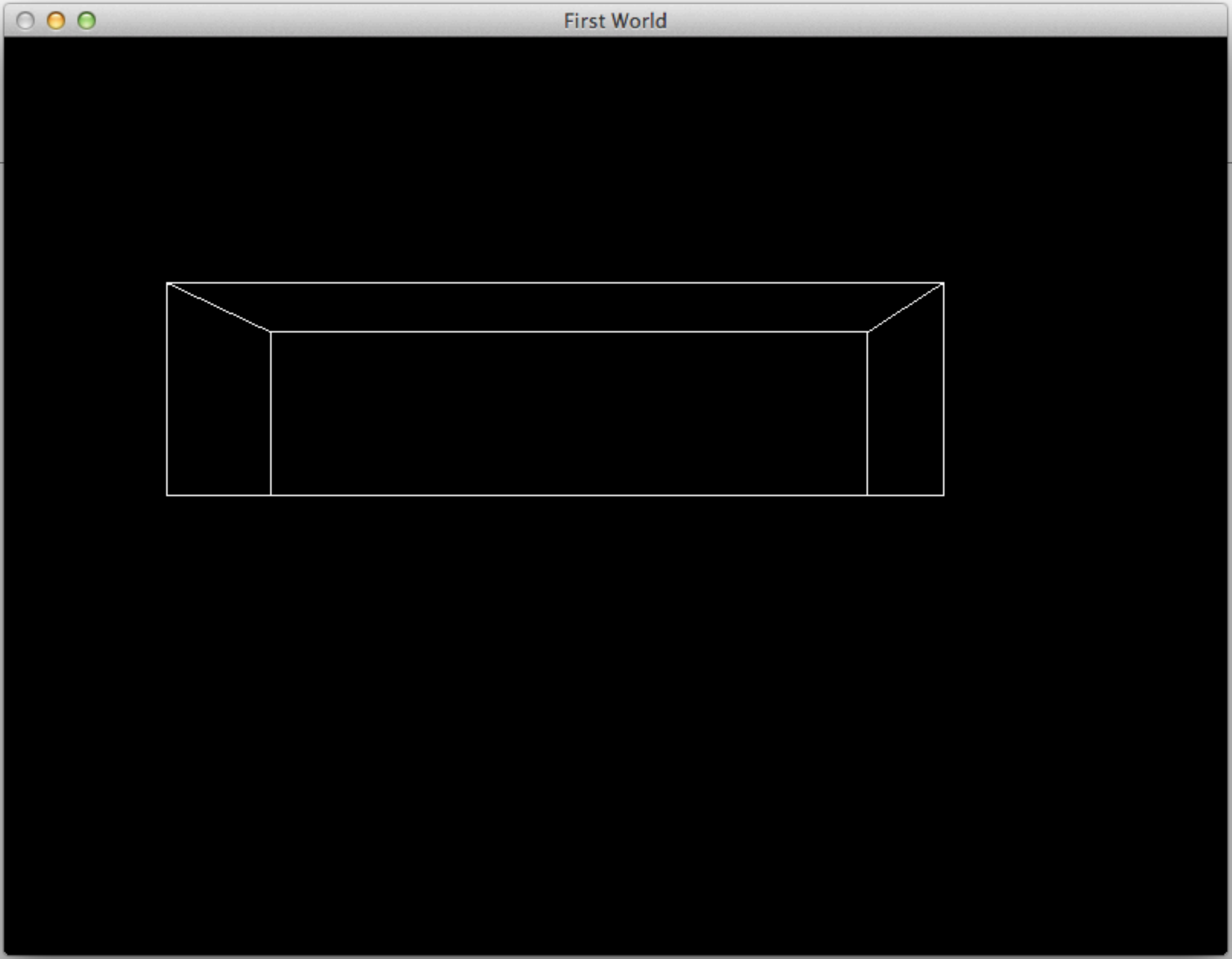
```
void World::initialize(int width, int height, std::string name)
{
  glutInit(argc, argv);
  glutInitDisplayMode(GLUT_DOUBLE | GLUT_RGB | GLUT_DEPTH);
  glutInitWindowSize(width, height);
  glutCreateWindow(name.c_str());

  Color::Black.renderClear();
  glEnable(GL_DEPTH_TEST);
  glFrontFace(GL_CCW);
  glPolygonMode(GL_FRONT,GL_LINE);
  glPolygonMode(GL_BACK,GL_LINE);

  glMatrixMode(GL_PROJECTION);
  glLoadIdentity();
  gluPerspective(60.0f, 1, 1.0, 1000.0);

  glMatrixMode(GL_MODELVIEW);
  glLoadIdentity();

  glutKeyboardFunc(keyboard);
  glutReshapeFunc(reshape);
  glutDisplayFunc(renderScene);
}

void World::start()
{
  glutMainLoop();
}
```

World Loading & Rendering

```
void World::render()
{
  glClearColor(0.0, 0.0, 0.0, 1.0);
  glClear(GL_COLOR_BUFFER_BIT | GL_DEPTH_BUFFER_BIT);
  glLoadIdentity();

  Vector3(0,0,-10).translate();
  theModel.render();

  glutSwapBuffers();
}

void World::loadModel (std::string modelName)
{
  ifstream inStream;
  inStream.open(modelName.c_str(), ios::in);
  if (!inStream.fail())
  {
    theModel.load(inStream);
  }
}
```

main

```
int main(int argc, char* argv[])
{
  theWorld.setCmdlineParams(&argc, argv);
  theWorld.initialize(800,600, "First World");

  theWorld.loadModel("cube.obj");
  theWorld.start();
  return 0;
}
```


First World